10-4 What is a battery?

Objectives ▸ Identify a battery as a series of electrochemical cells that are connected together. ▸ Contrast a wet cell and a dry cell.

TechTerms

- **battery:** series of electrochemical cells connected together
- **electrochemical cell:** device that changes chemical energy into electrical energy
- **electrode:** positive or negative pole of an electrochemical cell
- **electrolyte:** substance that dissolves in water to form a conducting solution

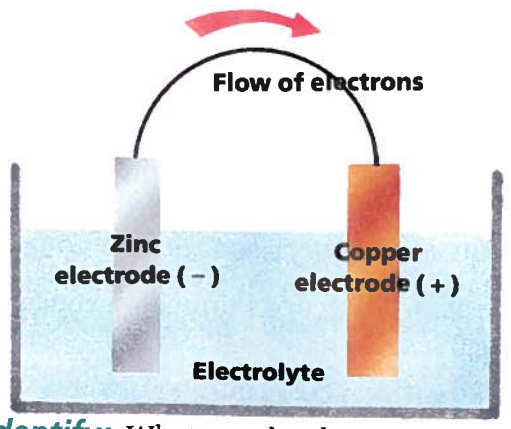
Battery A **battery** is a source of direct current. When you connect the negative and positive poles of a battery to a conductor, electric current flows through the conductor. A battery is a series of **electrochemical cells** that are connected together. An electrochemical cell changes chemical energy into electrical energy.

Describe: How does a battery produce electricity?

Wet Cell The simplest type of electrochemical cell is called a wet cell. A wet cell has three parts. They are a negative pole, a positive pole, and an **electrolyte.** An electrolyte is a substance that dissolves in water to form a conducting solution. The negative and positive poles of a wet cell are called **electrodes.** The negative electrode is made of zinc. The positive electrode is made of copper. Sulfuric acid is often used as an electrolyte.

A chemical reaction in the wet cell causes electrons to build up on the zinc electrode. When the two electrodes are connected by a wire, electrons flow from the zinc to the copper electrode. A car battery is made up of several wet cells.

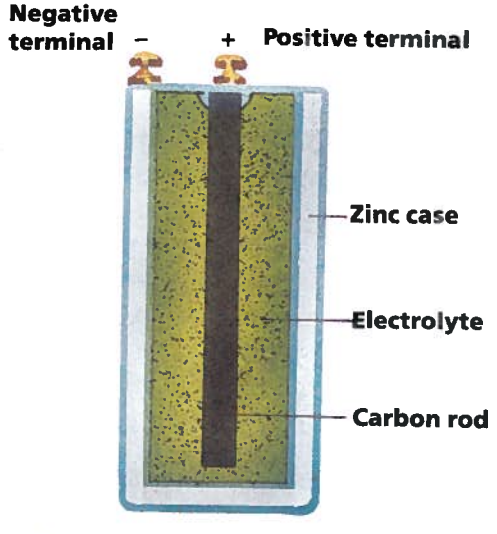
In a car's storage battery, two sets of metal plates act as electrodes. One set of plates is made of lead. The other set is made of lead dioxide. The electrolyte is sulfuric acid.



Identify: What are the three parts of a wet cell?

Dry Cell The most familiar type of electrochemical cell is called a dry cell. Dry cells are used in flashlights and radios. A dry cell works the same way as a wet cell. It has a positive electrode, a negative electrode, and an electrolyte. The electrolyte is a moist paste inside the cell. The outside case of the battery is usually made of zinc. It is the negative electrode. The positive electrode is sometimes made of carbon. It is inside the dry cell.

Another type of dry cell is the nickel–cadmium cell. The positive electrode is made of nickel oxide. The negative electrode is made of cadmium.



Contrast: How is the electrolyte in a dry cell different from that in a wet cell?

LESSON SUMMARY

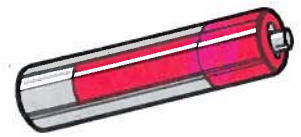
- A battery is made up of a series of electrochemical cells.
- The simplest type of electrochemical cell is a wet cell.
- The most familiar type of electrochemical cell is a dry cell.

CHECK *Complete the following.*

1. A _____ cell is used in a flashlight.
2. A car battery is made up of _____ cells.
3. The negative electrode of a wet cell is usually made of _____ .
4. A(n) _____ is a substance that dissolves in water to form a conducting solution.
5. An electrochemical cell converts _____ into electrical energy.
6. In a dry cell, the electrolyte is found _____ the cell.
7. A battery is a source of _____ current.
8. The positive and negative poles of a battery are called _____ .

APPLY *Complete the following.*

9. **Hypothesize:** Why do you think a car battery is sometimes called a storage battery?
10. **Infer:** Some batteries last longer if they are kept in a cold place, such as a freezer. What effect does the cold have on the battery?



Designing an Experiment

Design an experiment to solve the problem.

PROBLEM: Will a battery last longer if it is kept in a freezer before it is used?

Your experiment should:

1. List the materials you would need.
2. Identify safety precautions that should be followed.
3. List a step-by-step procedure.
4. Describe how you would record your data.

ACTIVITY

MAKING A LEMON WET CELL

You will need a lemon, a strip of copper, a strip of zinc, two wires, and a voltmeter.

1. Attach a wire to one end of each metal strip.
2. Insert the free end of each strip of metal at opposite ends of the lemon.
3. Attach the free ends of the wires to the terminals of the voltmeter. The voltmeter will indicate if electricity is flowing.

Questions

1. What is the positive electrode of your wet cell?
2. What is the negative electrode?
3. What is the electrolyte?